

# Superconducting Magnesium Diboride Thin Films for Ground Receiver Detectors, Phase II

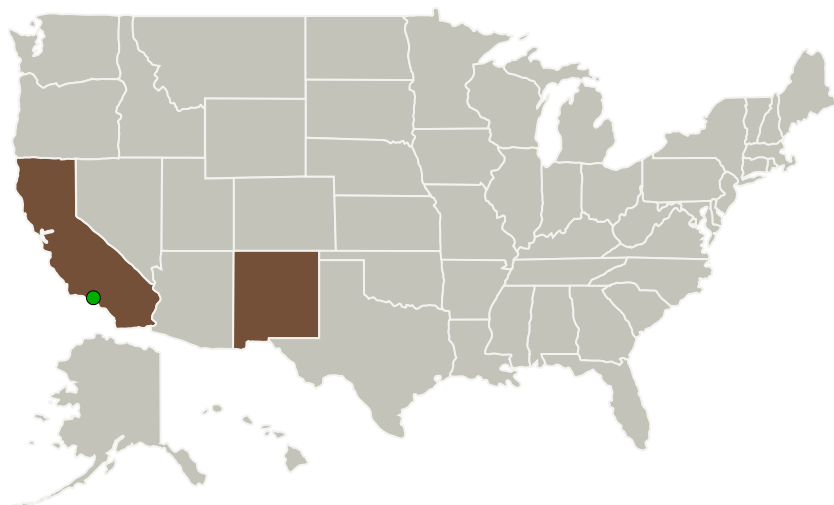
Completed Technology Project (2017 - 2019)



## Project Introduction

Superconducting films of magnesium diboride (MgB<sub>2</sub>) are very attractive for a range of detector and telecommunications applications owing to the high critical temperature of these films, ~40 K, which greatly simplifies the cooling requirements. We propose to develop a reactive evaporation technique for the deposition of MgB<sub>2</sub> thick films on wafers up to at least 4" diameter, and an etch back and passivation process to produce high-quality thin films that are needed for the development of superconducting single photon detectors (SNSPDs) and THz hot electron bolometer (HEB) mixers. Currently there is no domestic commercial source for MgB<sub>2</sub> films; the only commercial source we are aware of is an overseas vendor that can supply films only on very small (<1 cm<sup>2</sup>) chips. In Phase I, we demonstrated the feasibility of the etch back and passivation process, and completed designs for the reactive evaporation system that we will build in Phase II and develop a wafer-scale process for the deposition and production of MgB<sub>2</sub> films.

## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
STAR Cryoelectronics, LLC	Lead Organization	Industry	Santa Fe, New Mexico
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California



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## Primary U.S. Work Locations

California

New Mexico

## Project Transitions

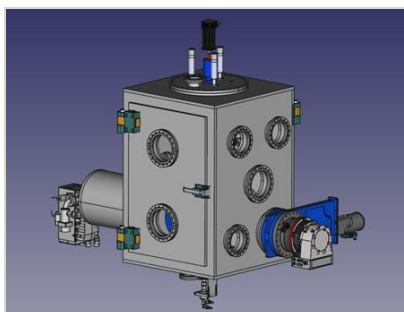
**April 2017:** Project Start

**April 2019:** Closed out

### Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/138691>)

## Images



### Briefing Chart Image

Superconducting Magnesium Diboride Thin Films for Ground Receiver Detectors, Phase II Briefing Chart Image (<https://techport.nasa.gov/image/133746>)



### Final Summary Chart Image

Superconducting Magnesium Diboride Thin Films for Ground Receiver Detectors, Phase II (<https://techport.nasa.gov/image/137203>)

## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Organization:

STAR Cryoelectronics, LLC

### Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

### Program Director:

Jason L Kessler

### Program Manager:

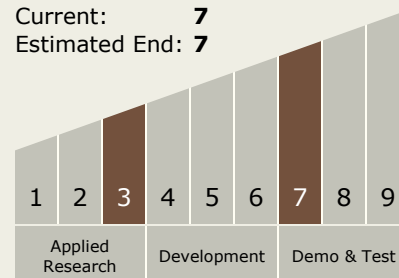
Carlos Torrez

### Principal Investigator:

Brian H Moeckly

## Technology Maturity (TRL)

Start: **3**  
Current: **7**  
Estimated End: **7**



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## Technology Areas

### Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - └ TX05.1 Optical Communications
    - └ TX05.1.1 Detector Development

## Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System